

Linxiao Wang

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Date of Birth	13 th February 1993	Email	lwang739@uwo.ca
Nationality	Chinese		

Education

2018-2022 (expected) Ph.D. Candidate in Computer Algebra - Department of Computer Science
[Western University](#)

Tentative thesis title: Integer hull computation and its application
Supervisor: [Prof. Marc Moreno Maza](#)

2016-2018 M.Sc. in Computer Science - Department of Computer Science
Western University

Thesis: [Putting Fürer's Algorithm into Practice with the BPAS Library](#)

2011-2015 B.Eng. in Information Security - School of Information
[Renmin University of China](#)

Research Experience

May 2018 - Present [Ontario Research Center of Computer Algebra \(ORCCA\) Lab at Western University](#)
Research assistant

Topic: **Improving running time of CUDA kernels with rational programs**

- Studied different running time prediction models for CUDA program
- Designed (with the research group) the technique of *rational program* that utilize the prediction models to optimize program parameters efficiently at runtime
- Implemented a rational program for optimizing the dimensions of CUDA kernels
- Released [KLARAPTOR](#): A tool for improving running time of CUDA kernels by estimating block dimensions built on top of CUPTI and LLVM.
- KLARAPTOR is built in the C programming language making use of
 - NVIDIA CUPTI API to measure low-level metrics,
 - LAPACK for linear algebra,
 - BPAS (Basic Polynomial Algebra Subprograms) for efficient rational functions, and
 - LLVM Pass Framework to connect the constructed rational program and the CUDA program.

- Sept. 2019** ORCCA Lab
- Present *Research assistant*
 Topic: **Integer hull computation and its application in loop optimization**
- Formally described and proved that the number of vertices of the integer hull of a polyhedral set has a pseudo-periodical behaviour.
 - Based on the above observation, designed an algorithm for computing the integer hulls of convex polyhedral sets of arbitrary dimensions.
 - Implementing the algorithm in both Maple and C/C++
 - Using the above algorithm, we propose an exact method for loop data delinearization
- May 2017** ORCCA Lab
- April 2018 *Research assistant*
 Topic: **Efficient prime field arithmetic of primes with large characteristics**
- Proposed the approach of using Fast Fourier transformation(FFT) to multiply elements in a prime fields with large characteristics (the primes are larger than one machine word)
 - Implemented efficient prime field arithmetic over Generalized Fermat primes including the fast multiplication
 - Helped to implement FFT over Generalized Fermat prime fields
 - The source code is released as part of the [BPAS Library](#)
- July 2015** Electronic Government Research Center at Chinese Academy of Governance
- May 2016 *Researcher*
 Topic: **Availability of E-government applications in provincial government agencies**
- Surveyed the availability of E-government applications in all provinces across China
 - Preliminarily collecting and analyzing collected data (Python)
- Sept. 2014** Information Security Lab at Renmin University of China
- June 2015 *Undergraduate student research assistant*
 Topic: **Public group key distribution**
- Designed and implemented (C/C++) a new method for public group key distribution scheme.
 - The new method targets the unstable ad hoc networks.
 - Extended the method for an efficient sub-/inter-group key distribution scheme

Internship/Fellowship Experience

- Nov. 2021** [Mitacs Accelerate Fellowship](#) with Maplesoft Inc.
- Feb. 2022 *Intern*
 Project: **Effective Algorithms in Polyhedral Geometry and Symbolic Analysis.**
- Designed a new algorithm for computing the integer hulls of 2D and 3D polyhedral sets while researching at Western University
 - Collaborated with the employees at Maplesoft Inc. to implement and integrate the algorithm with the PolyhedralSets library of Maple
 - The implementation will be in the Maple2022 release

Summer 2018 [IBM Center for Advanced Studies \(CAS\)](#)

Summer 2019 *Intern*

Project: **Comprehensive Optimization of Parametric Kernels for Graphics Processing Units**

- Collaborated with IBM Canada Compiler Optimizer Development unit to designed a new way to optimize compilers for GPU programs, especially those written in CUDA
- Designed (with my academic supervisor) the technique of *rational program* which can be built at compile time. At runtime, the rational program evaluate in linear time and generate the optimized parameters for the program.
- Implemented a rational program for optimizing the dimension parameters for CUDA kernels.

Other Experience

Sept. 2017 Teaching assistant
- Present *Western University*

Helping the instructors to organize the course, undertaking tasks like proctoring, marking, holding weekly office hours and giving tutorials.

- CS2209: Logic for computer science
- CS2214: Discrete Structures for Computing
- CS4402: Distributed and Parallel Systems
- Won the Faculty of Science Graduate Student Teaching Award (2021)

Sept. 2020 Graduate student engagement committee
- Present *Western University*

As most of department activities moved online under the impact of Covid-19, our committee is established to engage more graduate students into our community

- Helped the department surveying the living, working and mental conditions of our graduate students.
- Organized monthly virtual meetings for graduate students to discuss and present their research with each other
- Organized weekly virtual game nights

May 2021 [UWORCS 2021 committee](#)
Western University

UWORCS stands for University of Western Ontario Research in Computer Science. UWORCS is the annual internal departmental student conference intended to give students the opportunity to practice presenting to academic audiences.

- Selected and contacted potential keynote speakers
- Reaching out to student speakers across our university, especially from departments other than computer science
- Co-chaired the virtual conference

Publications and Presentations

- Integer Hulls of Polyhedral Sets
Maple Conference 2021
[Conference presentation](#)

- On the Pseudo-Periodicity of the Integer Hull of Parametric Convex Polygons
Moreno Maza, Marc, and Linxiao Wang. International Workshop on Computer Algebra in Scientific Computing. Springer, Cham, 2021.
[Paper](#) | [Conference presentation](#)
- Introduction to KLARAPTOR
IBM CASCON 2019 (software expo)
[Poster presentation](#)
- KLARAPTOR: A Tool for Dynamically Finding Optimal Kernel Launch Parameters Targeting CUDA Programs.
Brandt, A., Mohajerani, D., Maza, M. M., Paudel, J., & Wang, L. arXiv preprint arXiv:1911.02373 (2019).
[Paper](#)
- Big Prime Field FFT on Multi-core Processors.
Svyatoslav Covanov, Davood Mohajerani, Marc Moreno Maza, Linxiao Wang. In Proceedings of ISSAC 2019. ACM Press, 106–113, 2019.
[Paper](#) | [Conference presentation](#)
- Efficient Sub-/Inter-Group Key Distribution for ad hoc Networks.
Bo Qin, Linxiao Wang, Yujue Wang, Qianhong Wu, Wenchang Shi, Bin Liang. In: Au M.H., Carminati B., Kuo CC.J. (eds) Network and System Security. NSS 2015.
[Paper](#)
- Versatile lightweight key distribution for big data privacy in vehicular ad hoc networks.
Bo Qin, Linxiao Wang, Yujue Wang, Qianhong Wu, Wenchang Shi, Bin Liang. Concurrency and Computation: Practice and Experience, 28.10 (2016), 2920-2939.
[Paper](#) | [Conference presentation](#)

Skills

- **Programming Languages**

C/C++, CUDA
Linux system programming - bash, lex, yacc
x86 Assembly language
Python, Java, LaTeX

- **Languages**

Fluent in English and Chinese (Mandarin)